WHAT IS CLAIMED IS:

1. An electro-mechanical transmission system, comprising at least two compounded epicyclic gearsets, one gear element of a first of the gearsets being connected to an input shaft which is connected to a prime mover, and one gear element of a second of the gearsets being connected to an output shaft, rotors of two electric machines being connected to respective gear elements of the first and second gearsets, electrical connections of stators of the machines being connected together via a controller arranged to control flow of electrical power between the machines and an energy receiver, the controller being operable to direct at least a proportion of electrical power from one of the machines operating as a generator to the energy receiver to increase the torque applied to the output shaft.

2. A system as claimed in claim 1 in which electrical power from the machine operating as a generator is diverted from the other machine to the energy receiver.

3. A system as claimed in claim 1 in which the controller is operable to compare a signal indicative of demanded torque with a predetermined threshold and to direct the proportion of electrical power to the energy receiver when the signal exceeds the predetermined threshold.

4. A system as claimed in claim 1 in which the controller is operable to compare a signal indicative of the speed of the output shaft with a predetermined threshold and to direct the proportion of electrical power to the energy receiver when the signal is below the predetermined threshold.

5. A system as claimed in claim 4 in which the predetermined threshold is a first predetermined threshold, further in which the controller is operable to compare a signal indicative of demanded torque with a second predetermined threshold and to direct the proportion of electrical power to the energy receiver only when the signal indicative of demanded torque exceeds the second predetermined threshold and when the signal indicative of the speed of the output shaft is below the first predetermined threshold.

6. A system as claimed in claim 3 in which a transition to directing the proportion of electrical power is governed by a control process including proportional-plus-integral action.

7. A method of operating an electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, one gear element of a first of the gearsets being connected to an input shaft which is connected to a prime mover, and one gear element of a second of the gearsets being connected to an output shaft, rotors of two electric machines being connected to respective gear elements of the first and second gearsets, electrical connections of stators of the machines being connected together such that electrical power is transferable between the machines and an energy receiver, the method comprising directing at least a proportion of electrical power from one of the machines operating as a generator to the energy receiver to increase the torque applied to the output shaft.

8. A method as claimed in claim 7 in which the electrical power from the machine operating as a generator is diverted from the other machine to the energy receiver.

9. A method as claimed in claim 7 in which a controller is operable to compare a signal indicative of demanded torque with a predetermined threshold and to direct the proportion of electrical power to the energy receiver when the signal exceeds the predetermined threshold.

10. A method as claimed in claim 7 in which a controller is operable to compare a signal indicative of the speed of the output shaft with a predetermined threshold and to direct the proportion of electrical power to the energy receiver when the signal is below the predetermined threshold.

11. A method as claimed in claim 10 in which the predetermined threshold is a first predetermined threshold, further in which the controller is operable to compare a signal indicative of demanded torque with a second predetermined threshold and to direct the proportion of electrical power to the energy receiver only when the signal indicative of demanded torque exceeds the second predetermined threshold and when the signal indicative of the speed of the output shaft is below the first predetermined threshold.

12. A method as claimed in claim 9 in which a transition to directing the proportion of electrical power is governed by a control process including proportional-plus-integral action.

13. A method of operating an electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft driven by a prime mover and connected to one gear element of a first of the gearsets, an output shaft providing output torque and connected

to one gear element of a second of the gearsets, two electrical machines, rotors of which are connected to respective gear elements of the first and second gearsets and each of which is able to operate either as a motor or a generator and stators of which are connected together via a controller arranged to control the flow of electrical power between the machines, which method includes increasing the torque available at the output shaft by directing electrical power from at least one of the machines to an electrical load comprising a dump resistor.

14. A method of operating an electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft driven by a prime mover and connected to one gear element of a first of the gearsets, an output shaft providing output torque and connected to one gear element of a second of the gearsets, two electrical machines, rotors of which are connected to respective gear elements of the first and second gearsets and each of which is able to operate either as a motor or a generator and stators of which are connected together via a controller arranged to control the flow of electrical power between the machines, which method includes increasing the torque available at the input shaft by mechanically braking at least one of the electrical machines.

15. A method as claimed in claim 14 in which only an electrical machine which is operating as a generator is braked.

16. A method of operating an electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft driven by a prime mover and connected to one gear element of a first of the gearsets, an output shaft providing output torque and connected

to one gear element of a second of the gearsets, two electrical machines, rotors of which are connected to respective gear elements of the first and second gearsets and each of which is able to operate either as a motor or a generator and stators of which are connected together via a controller arranged to control the flow of electrical power between the machines, which method includes increasing the torque available at the output shaft by causing one or both of the electrical machines to operate less efficiently.

17. A method of operating an electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft driven by a prime mover and connected to one gear element of a first of the gearsets, an output shaft providing output torque and connected to one gear element of a second of the gearsets, two electrical machines, rotors of which are connected to respective gear elements of the first and second gearsets and each of which is able to operate either as a motor or a generator, a third electrical machine, operable as a motor, and having its output shaft connected to one of the input and output shafts of the transmission system, all three machines having electrical connections of their stators connected together via a controller arranged to control the flow of electrical power between the machines, which method includes increasing the torque available at the output shaft by directing electrical power from at least one of the machines which is operating as a generator to the third electrical machine.

18. A method of operating an electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft driven by a prime mover and connected to one gear element of a first of the gearsets, an output shaft providing output torque and connected to one gear element of a second of the gearsets, two electrical machines, rotors of which are

connected to respective gear elements of the first and second gearsets and each of which is able to operate either as a motor or a generator and stators of which are connected together via a controller arranged to control the flow of electrical power between the machines, which method includes increasing the torque available at the output shaft by directing electrical power from at least one of the machines which is operating as a generator to an electrical load comprising a rechargeable electric battery.

19. A method of operating an electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft driven by a prime mover and connected to one gear element of a first of the gearsets, an output shaft providing output torque and connected to one gear element of a second of the gearsets, two electrical machines, rotors of which are connected to respective gear elements of the first and second gearsets and each of which is able to operate either as a motor or a generator and stators of which are connected together via a controller arranged to control the flow of electrical power between the machines, which method includes monitoring a signal indicative of the level of torque required at the output shaft and extracting energy in mechanical or electrical form from the transmission system when the said signal exceeds a predetermined value.

20. A method as claimed in claim 19, further including accelerating the output shaft from a rest condition, in which the two electrical machines act as a generator and a motor, respectively.

21. An electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft adapted to be driven by a prime mover and connected to

one gear element of a first of the gearsets, an output shaft which, in use, provides output torque and is connected to one gear element of a second of the gearsets, two electrical machines, rotors of which are connected to respective gear elements of the first and second gearsets and each of which is able to operate either as a motor or a generator and stators of which are connected together via a controller arranged to control the flow of electrical power between the machines, and a mechanical brake arranged to brake at least one of the electrical machines.

22. An electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft adapted to be driven by a prime mover and connected to one gear element of a first of the gearsets, an output shaft which, in use, provides output torque and is connected to one gear element of a second of the gearsets, two electrical machines, rotors of which are connected to respective gear elements of the first and second gearsets and each of which is able to operate either as a motor or a generator and stators of which are connected together via a controller arranged to control the flow of electrical power between the machines and a third electrical machine, which is operable as a motor and whose output shaft is connected to one of the input and output shafts and which is connected to at least one of the said two electrical machines to be electrically powered thereby.

23. An electro-mechanical transmission system comprising at least two compounded epicyclic gearsets, having an input shaft adapted to be driven by a prime mover and connected to one gear element of a first of the gearsets, an output shaft which, in use, provides output torque and is connected to one gear element of a second of the gearsets, two electrical machines, rotors of which are connected to respective gear elements of the first and second gearsets and each of

which is able to operate either as a motor or a generator and stators of which are connected together via a controller arranged to control the flow of electrical power between the machines, a sensor arranged to produce a signal indicative of the level of torque required at the output shaft, means for monitoring the said signal and means controlled by the monitoring means for extracting power in mechanical or electrical form from the transmission system when the said signal exceeds a predetermined value.